IMPROVED ARCHERY BROADHEAD WITH REPLACEABLE BLADES

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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 60/420,682, Filed: October 24, 2002, Titled: IMPROVED ARCHERY BROADHEAD WITH REPLACEABLE BLADES, which is incorporated by reference herein.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention generally relates to arrowheads for arrows, particularly to broadhead arrowheads, and specifically to broadhead arrowheads formed from replaceable and interchangeable components.

Related Art

[0003] The sport of archery includes activities ranging from target practice to game hunting, and the art of providing arrows suitable for each of such purposes has become highly developed. Archery is a type of leisure activity having a very active following. There is a continual demand in the archery field for improved equipment including arrowheads for arrow shanks. Specifically, a need exists for arrowheads that are strong and durable even though of an assembled nature. Further, such arrowheads should allow ease of assembly to allow the use of replaceable and interchangeable components including blades allowing the cutting edges of the arrowhead to be sharpened or replaced. Furthermore, even though easily disassembled by the user, such arrowheads should not fall apart in use even when hitting firm or solid objects such as bones. Additionally, such arrowheads should have a minimal weight ratio to allow use of heavier blades while minimizing the total weight.

Likewise, such arrowheads should maximize the cutting edges of the blades and provide minimum resistance for maximum penetration.

[0004] A great many types of arrowheads have been developed, with each designed to serve a particular purpose and having specific operating characteristics. Thus, arrowheads specifically intended for hunting large, thick-skinned, heavy-boned game such as bear have been developed. Additionally, heads particularly suitable for hunting large thinner-skinned, lighter-boned game such as deer have been developed. Arrowheads have also been developed for hunting fowl, particularly turkey, for hunting squirrels and other small game, and for bow-fishing. When such specially designed arrowheads are attached to the arrow shaft in non-releasable fashion, it is necessary for the archer to have a wide range of arrows, some for target shooting, some for hunting larger game, some for smaller game.

[0005] Arrowheads with interchangeable blades have been proposed in an effort to increase the versatility of the arrowhead while economizing in the amount of materials needed for production. Systems typical of this general approach are disclosed in U.S. Patent No. 2,940,758 to Richter, U.S. Patent No. 4,036,479 to Sherwin, U.S. Patent No. 4,146,226 to Sorenson and U.S. Patent No. 4,210,330 to Kosbab. Such systems typically employ a plurality of independent blades, each of which can be fitted into a different one of a plurality of slots in a central body. Usually, the blades are then clamped by axially-acting clamp members that are separate from the arrowhead body, or the body itself may act as a clamp member. Since a plurality of blades are clamped, the blades tend to be held less securely and tend to become loose during use. Since the blades themselves must be clamped to the arrowhead body, there is an increased likelihood that the blades will fracture or shear on impact, at or near the points where the blade is clamped. Moreover, leading edge clamps are blunt, as compared to the edges of the blades, which impedes penetration.

[0006] While prior-art proposals have achieved significant acceptance in the trade, there has been a continuing need for improvement, particularly in the

ease of assembly of the arrowhead and its ability, once assembled, to withstand the rigors of actual use.

SUMMARY OF THE INVENTION

[0007] Accordingly, the present invention is related to an improved broadhead with replaceable components that substantially obviates one or more of the disadvantages of the related art.

[0008] In one embodiment, there is provided a broadhead including a ferrule for mounting an arrowshaft, the ferrule having a locking portion. At least two blades are mounted on the ferrule (three are used in a preferred embodiment), the blades being coupled to the ferrule in their center portions by notches that mate with the locking portion of the ferrule. A locking nut is mounted on a rear portion of the ferrule for holding the three blades in place on the ferrule when the locking nut is tightened.

[0009] Additional features and advantages of the invention will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the invention. The advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0010] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS/FIGURES

[0011] **FIGs. 1A** and **1B** show a side view of an assembled broadhead of two embodiments of the present invention.

[0012] **FIG. 2** shows a head-on view of the broadhead of **FIG. 1A**.

[0013] **FIGs. 3A** and **3B** show a detailed view of the ferrule used in the broadhead of **FIGS. 1A** and **1B**, respectively.

[0014] **FIG. 4** shows a head-on view of the ferrule of **FIG. 3A**.

[0015] **FIGS. 5A-5C** show detailed views of broadhead blades of **FIGs. 1A** and **1B**.

[0016] **FIG. 6** is a detailed view of the locking nut of the broadhead of **FIG. 1**.

[0017] **FIGs. 7A** and **7B** show an alternative embodiment of a locking nut.

[0018] **FIG. 8** shows a photograph the broadhead of **FIG. 1B** with the locking nut of **FIGs. 7A** and **7B**.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0020] **FIG. 1A** shows a side view of an assembled broadhead of one embodiment of the present invention, and **FIG. 2** shows a head on view of the same broadhead. As shown in **FIGS. 1A** and **2** (generally moving from left to right in **FIG. 1A**), the broadhead has a mating portion **101** that attaches to an arrowshaft (not shown). A ferrule **105** has a rear body portion **102** with a locking thread **103**, on which a locking nut **110** is mounted. The ferrule **105** also has a center cylindrical body portion **108**, a flange **107**, and a forward cylindrical body portion **111**. A conical front portion **109** includes a conical ferrule tip portion **106**.

[0021] The ferrule **105** also forms the mounting element for blades **104**. In the preferred embodiment, three blades **104** are mounted on the ferrule **105**, such that upon mounting of the blades **104**, the locking nut **110** is used to tighten the blades **104** in place on the ferrule **105**. **FIG. 1B** shows another embodiment of the broadhead, with a blade as illustrated in **FIG. 5C**, discussed below.

[0022] **FIG. 3A** is a detailed illustration of the ferrule **105** of the present invention. With regard to **FIG. 3A**, note in particular a recess portion **301**, formed by surfaces **302** and an outer surface of the cylindrical body portion

111. The recess portion **301** is used to assist with locking the blades **104** into place by using a locking projection **305**. The curved dashed line in **FIG. 3A** corresponds to a slot **401**, shown in **FIG. 4,** which illustrates a head on view of the ferrule **105**. Note in particular the slots **401**, each of which receives one blade **104** for mounting on the ferrule **105**. **FIG. 3B** illustrates an alternative embodiment of the ferrule **105**, with a smaller center cylindrical body portion **108**. This embodiment can be used with the locking nut **110** shown in **FIG. 1B** and **FIGS. 7A-7B** (discussed below).

[0023] **FIGS. 5A-5B** are detailed illustrations of the blade **104**, showing a side view and an end view, respectively. Note that in this and other figures, the dimensions and angles shown are exemplary only, and should not be viewed as constituting a limitation of the invention. As shown in **FIGS. 5A-5B**, the blade **104** includes a forward edge surface **501**, which is ground to form a razor edge. Furthermore, the blade **104** includes a notch (or recess) portion **502**, such that the locking projection **305** and the notch portion **502** mate with surfaces **302**, **111**, and the recess portion **301** of the ferrule **105**. The blade **104** also includes a rear edge **503** (usually not sharpened), a rear locking surface **504** (for coupling to the locking nut **110**), a blade edge **506**, a forward portion **510** and a forward tip point **505**. There may be a clearance at "A," as shown in **FIG. 5A**, or, alternatively, the forward portion may be beveled at 120° (see location **201** in **FIG. 2**). **FIG. 5C** shows another embodiment of the blade **104**, with the area "B" of the blade **104** (part of the notch portion **502**) having a gradual curvature.

[0024] **FIG. 6** illustrates the locking nut **110**, which preferably has a light straight knurl on its outer surface (not shown in the figures). The locking nut **110** is used to tighten blades **104** on the ferrule **105** once the blades **104** are mounted on the ferrule **105**. The locking nut **110** also has an angled portion **601**, which abuts the blades **104** when tightened. The angled portion 601 supports the blades **104** when tightened.

[0025] Further with reference to **FIGS. 2** and **5A**, in one embodiment, the forward portions **510** of the blades **104** may abut each other, as shown in the

center of **FIG. 2** (see location **201** in **FIG. 2**). Each of the blades **104** is machined (beveled) in their forward portions at 120° (or 360° divided by the number of blades in a particular embodiment, if the number of blades is other than three), such that when the three blades **104** are brought together, they abut each other snugly.

[0026] The broadhead of the present invention has an advantage in that it has user-replaceable blades that "cut on impact." The "cut on impact" feature permits the cutting edge of the blades **104** to begin cutting upon impact, compared to a conventional solid tip that secures the tips of the three blades **104**. Furthermore, the broadhead of the present invention can "lock in" the blades **104** to the ferrule **105** in the middle portion of the ferrule **105** and the blades **104**, further enhancing stability and performance of the broadhead. Thus, unlike conventional broadheads that use notches at ends of a ferrule, the present invention uses the recess portion **301** in the center portion of the ferrule **105**, resulting in a more stable broadhead upon impact.

[0027] As noted above, the broadhead of the present invention, in one embodiment, has blades **104** that support each other during impact due to the 120° beveling arrangement. Furthermore, the broadhead has a locking nut **110** that retains the blade **104** in the ferrule body **105** at the location on the ferrule body **105** shown in **FIG. 1A** and **1B**. This allows the broadhead to remain assembled even when it is not on the arrow shaft.

[0028] Securing the blades **104** at their leading edge tip may be disadvantageous, because the blade tip is thinner, and thus weaker. Securing the blades **104** at about their mid-section provides for a much more secure fastening technique, since the blades **104** are stronger at that point. In addition to having the spine (forward) portions of the blades **104** beveled at 120°, it is also possible to have the back of the tips be somewhat recessed (see clearance A in **FIG. 5A**), permitting clearance upon assembly. Thus, one of the advantages of the present invention is that it provides replaceability of individual blades **104** with cut-on-impact performance.

[0029] Additionally, as shown in **FIGs. 7A** and **7B**, showing a head-on view, and a side view, respectively, the locking nut **110** in its preferred embodiment, instead of having a round cross section with a knurl, can have flat surfaces (e.g., surfaces designated by **701a-701d** in **FIGs. 7A** and **7B**). These surfaces **701a-701d** allow the broadhead to be assembled and tightened by hand prior to its being mated with the arrow shaft. The flat surfaces **701a-701d** preferably have rounded corners (see **801** in **FIG. 8**, which shows a photograph of one embodiment of the invention), which serve to support the assembled broadhead in the arrow insert in a snug and vibration-free manner. This holds the broadhead more rigidly on the arrow, and does not permit it to move as much.

[0030] The blades **104** are usually made of stainless steel, preferably lead-free stainless steel. The nut and ferrule are also preferably made of steel, and preferably lead free steel. Titanium can also be used for any of the elements of the broadhead, including the nut **110**, the ferrule **105**, and the blades **104**. Also, composite materials, or other metals may be used.

[0031] A typical manufacturing process for the blades **104** uses stamping and sharpening of the blades **104**. The ferrule **105** is typically machined. Other manufacturing processes are possible, e.g., machining the blades **104**.

[0032] Electroless nickel plating is preferred for the nut **110** and ferrule **105**, although additional coatings may be added, such as various friction-reducing (or self-lubricating) coatings, deposited titanium nitride coatings, and Teflon™ coatings. Similarly, the blades **104**, or the bolts (not shown in the figures) may be plated with any of the coatings described above as well.

[0033] One of the advantages of the present inventing is that an arrow with the broadhead described above has the same aerodynamic performance as an arrow with a field point, which is used for practicing. Thus, a shooter does not need to re-sight his bow when switching from practice arrowheads to the broadhead.

[0034] Arrows using the present invention have been measured moving in excess of 300 feet per second while holding field point accuracy and

groupings. Conventional broadheads lose accuracy as speed increases (typically over 250 feet per second), and do not group like field points even at low speeds.

[0035] The three blades **104** described above mimic the fletching of the arrow (i.e., the "feather" part on the rear portion of the arrow). This improves the aerodynamic performance of the arrow.

[0036] Another advantage of the present invention is the high penetrating ability, compared to conventional broadheads. The broadhead of the present invention when used at 20 yards and 300 feet per second, results in an accuracy of ¼ inch.

[0037] Note that although the preferred embodiment has been described in terms of three blades **104**, there may be fewer blades (e.g., two), or more blades (e.g., four or more), where the invention is also applicable.

[0038] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example, and not limitation. It will be apparent to persons skilled in the relevant art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention. This is especially true in light of technology and terms within the relevant art(s) that may be later developed. Thus, the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.